

NORTHERN GOSHAWK (*Accipiter gentilis*)

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Criteria Scores

| Population Trend | Range Trend | Population Size | Range Size | Endemism | Population Concentration | Threats |
|------------------|-------------|-----------------|------------|----------|--------------------------|---------|
| 10 | 5 | 7.5 | 5 | 0 | 0 | 10 |

Special Concern Priority

California: Currently ranked as a Bird Species of Special Concern, Priority xx. Considered a Bird Species of Special Concern by Remsen (1978).

Federal: Listed as a Sensitive Species and Management Indicator Species in California by the Pacific Southwest Region of the USDA Forest Service.

Other:

Breeding Bird Survey Statistics for California

Breeding Bird Survey is inadequate for estimating trend because northern goshawks occur on few routes in California (n=6) (Sauer et al. 2000). Trends based on Christmas Bird Count data for California suggest a stable population between 1959-1988 (trend = 0.2, 95% CI = -0.6-1.1, n= 33), although estimates are of questionable reliability because of small sample sizes and low abundance (Sauer et al. 1996). Bias may also be introduced because of identification errors due to similarity in juvenile plumage between northern goshawks and congeneric Cooper's hawks (*A. cooperii*) and sharp-shinned hawks (*A. striatus*).

General Range and Abundance

Northern goshawks are distributed throughout forests and woodlands of the Holarctic (Brown and Amadon 1968, Squires and Reynolds 1997). Their North American breeding distribution ranges

from the boreal forest across Alaska and Canada south through mixed-conifer forests in the East as far south as Pennsylvania and New York. In the western United States goshawks occur as breeders in conifer forest types and aspen-shrubsteppe vegetation types in mountains throughout the West, extending through the mountains of Mexico as far south as Jalisco and southern Guerrero (Howell and Webb 1995, Squires and Reynolds 1997). Wintering birds occur across a wider range of elevations and vegetation types.

Two sub-species are currently recognized by the American Ornithologists Union (1983).

A.g. atricapillus breeds throughout North America except in areas occupied by other subspecies.

A.g. laingi breeds on Queen Charlotte Is. and Victoria Is. Recognition of a third subspecies **A.g. apache**, resident from southern Arizona through Mexico, is currently debated (Squires and Reynolds 1997).

Seasonal Status in California

In California, northern goshawks are distributed as breeders in the North Coast Range as far south as Sonoma County, across the Cascades and Modoc plateau and south through the Sierra Nevada and White and Inyo Mountains as far south as the Tehachapi Mountains. Scattered historical and recent breeding records and observations of adults during the breeding period suggest the presence of small breeding populations in the Mount Pinos-Frazier Mountain area and in the San Gabriel, San Bernardino, San Jacintos, and Cuyamaca Mountain Ranges of southern California (Garret and Dunn 1981, Bloom et al. 1986, Lentz 1993, Kiff and Paulson 1997, Keane and Woodbridge, unpubl. data). No breeding records are known from the Central Coast Ranges. Northern goshawk observations are irregularly reported from outside the known breeding range during the non-breeding period. In California, northern goshawks breed in a number of conifer and mixed-conifer-hardwood forest types, as well as in aspen stringers within aspen-shrubsteppe vegetation, between approximately 600-3100m elevation.

Year-round residents throughout all or most of California range based on observations and telemetry studies (Hargis et al. 1994, Keane 1999). In the Lake Tahoe Basin, territorial adult males and females exhibited 3-4 times increase in winter home ranges compared to breeding home ranges but stayed on their territory and regularly spent time in the nest stands throughout the non-breeding period (Keane 1999). Individuals nesting in eastside pine habitat on the Lassen National Forest exhibited upslope movements into denser white fir habitats in late fall and winter (Rickman et al., unpubl.data). Seasonal elevational movements or shifts of use areas may occur in other regions or territories located at very high elevations. Populations in northern North America are facultative migrants, with few to most individuals migrating in any one year depending on prey availability linked strongly to the ten-year snowshoe hare (**Lepus americanus**) cycles (Squires and Reynolds 1997, Doyle and Smith 2001). Migrants from northern populations likely occur in California during some winters. An unprecedented number of northern goshawks occurred across southern California in the winter of 1916-1917 (Grinnell and Miller 1944).

Historical Range and Abundance in California

Grinnell and Miller (1944) described the breeding range of the northern goshawk as the higher altitudes in the northern third of the state south to Mendocino County in the Coast Ranges and south to Tulare County in the Sierra Nevada. Winter records of individuals were recorded from lower elevations and the southern part of California. No information is available to estimate historic abundance. Grinnell and Miller (1944) reported the species as not common.

Recent Range and Abundance in California

A synthesis of historic and current breeding and distributional records based on federal and state agency records, private land management companies, museum records, and literature records indicate that northern goshawks are still well distributed across their core breeding range in most of the Sierra Nevada, Southern Cascades, Klamath and Modoc Bioregions (Keane and Woodbridge, unpubl. data). Concern exists for potential range contraction, reductions in breeding densities, or

generally low breeding densities in five areas of California: (1) southern California mountains; (2) southern Sierra Nevada; (3) coastal redwood vegetation type in northwestern California; (4) eastside pine vegetation type in northeastern California; (5) the ponderosa pine vegetation type on the western slope of the Sierra Nevada.

The historical and current distribution of northern goshawks in the mountains of southern California is uncertain due to limited information. Only seven confirmed and 1 suspected breeding records have been reported for this bioregion. Of these records, 4 are from Ventura County (2 egg sets collected at different sites in 1904 and 1919; 2 nest records from separate territories reported active in 1989-1991). Two egg sets were collected in 1937 from the Cuyamaca Mountains in San Diego County (Kiff and Paulson 1997, Keane and Woodbridge, unpubl. data). Reports of an active nest and of an aggressive pair of adults during the breeding period have been reported from 2 sites in the San Jacintos Mountains (Keane and Woodbridge, unpubl.data). Approximately 25 breeding period sighting records of adult goshawks throughout the mountains of southern California over the past 50 years have been reported in American Birds/Field Notes, with about half of these sightings from the San Jacintos Mountains (Keane and Woodbridge, unpubl.data). Specialized surveys to inventory goshawks have not been conducted in this bioregion. Northern goshawks were not recorded during extensive surveys for California spotted owls (*Strix occidentalis occidentalis*) in the San Bernardino and other mountain ranges in southern California (W. LaHaye, pers. comm.). Limited historic nest records suggest that goshawks likely bred across this region, although it is unknown how commonly or regularly. Surveys are required to determine current status.

There is a paucity of records for the southern Sierra Nevada south of Yosemite National Park (Sierra and Sequoia National Forests, Sequoia-Kings Canyon National Parks) with approximately 25-30 recent nest records. Whether this represents the results of low survey effort (limited survey effort has been expended in these areas), low breeding densities near the southern edge of goshawk distribution in the southern Sierra Nevada, habitat conditions in the southern

Sierra Nevada, or potential reductions in densities or distribution at the edge of the species range is uncertain.

Concern exists for potential range contractions in the coastal redwood vegetation type, where very few current breeding records have been located. Recent goshawk surveys (2001) in suitable and suspected sites located 1 occupied goshawk territory in the coastal redwood region (B. Woodbridge, pers. comm.). Reductions in distribution have also likely occurred in two additional areas of California. Northern goshawks no longer occur in extensive areas of eastside pine vegetation of northeastern California where extensive railroad logging eliminated habitat (B. Woodbridge, pers. comm.). Further, extensive logging has occurred on the lower west slope of the Sierra Nevada, with a concomitant loss of 95-99% of the original old-growth ponderosa pine type (Franklin and Fites 1996). Goshawks are known to nest down to about 2500 ft on the west slope so it is likely that reductions in mature and old-growth pine has resulted in reductions in goshawk numbers in this vegetation type.

Population trends are unknown. Distributional changes and loss of breeding territories due to timber harvest and wildfire across their range suggests that population size has been reduced. Bloom et al. (1986) estimated a statewide population of approximately 1300 breeding territories. Recent synthesis of existing breeding territory records resulted in approximately 1000 known territories statewide documented between 1970-2001 (Keane and Woodbridge, unpubl. data). The majority of nest territory records were reported from the previous 12 years due to increased conservation focus and development of specialized survey procedures efforts targeted for northern goshawks.

Ecological Requirements

Key ecological requirements for northern goshawks are suitable nesting habitat, foraging habitat, and prey availability. Northern goshawks nest in mature and old-growth forest stands over much of their California range and in mature aspen stands within the aspen-shrub steppe vegetation type.

Nest stands have consistently larger trees, greater canopy cover, and relatively more open understories compared to non-nest stands (Saunders 1982, Hall 1984, Hargis et al. 1994, Keane 1999, Maurer 2000). In most forest vegetation types canopy cover around the nest tree is usually 60-100%, although it is lower (25-40%) in the naturally more open eastside pine vegetation type. Stick nests are usually placed in some of the larger available trees or snags. Woodbridge and Detrich (1994) reported annual territory re-occupancy rates approached 100% when approximately 200 acres of suitable nest stand habitat was available. Breeding period home ranges of individuals in the Sierra Nevada average approximately 1800-2600 ha (range approximately 800-6200 ha: 95% adaptive kernel)(Hargis et al. 1994, Keane 1999). Non-breeding period home ranges averaged about 5500 ha for females (range 1400-12,100 ha) and 8200 ha for males (range 1500-15,000 ha: 95% adaptive kernel)(Keane 1999). In the southern Cascades, breeding period home ranges averaged about 2400 ha for males (range 1000-3900 ha) and about 3800 ha for females (range 2000-6900 ha: 100% minimum convex polygon)(Austin 1993).

Northern goshawk populations exhibit high annual variation in reproduction with 30-90% of pairs breeding in any year. Variation in reproduction is associated with annual variation in weather and prey abundance (Keane 1999). Although northern goshawks will prey on a large number of species, several important species and species groups dominate the majority of prey items and biomass in California (Keane 1999, McCoy 1999, Maurer 2000). These species are the Douglas squirrel (*Tamiasciurus douglasii*), golden-mantled ground squirrel (*Spermophilus lateralis*), Belding ground squirrel (*S. beldingi*), western gray squirrel (*Sciurus griseus*), hares and rabbits (*Lepus* spp., *Sylvilagus* spp.), chipmunks (*Tamias* spp.), American robin (*Turdus migratorius*), northern flicker (*Colaptes auratus*), and Steller's jay (*Cyanocitta stelleri*). Douglas squirrels are an especially important prey species that affects northern goshawk reproduction because they are non-migratory and active year-round and therefore are available in late-winter and early-spring when goshawks require additional energy to attain the necessary energetic condition to reproduce (Keane 1999).

Golden-mantled and Belding ground squirrels are additional key prey species, particularly in areas outside the range of Douglas squirrels. Douglas squirrels are associated with mature and old-growth forest while golden-mantled and Belding ground squirrels are associated with more open forest conditions, shrub environments and meadows (Zeiner et al. 1990).

Goshawks forage in mature and old-growth forests that have relatively dense canopies (Widen 1989, Austin 1993, Bright-Smith and Mannan 1994, Hargis et al. 1994, Iverson et al. 1996, Beier and Drennan 1997), but also capture prey in a variety of vegetative cover, including meadow edges and open sagebrush (Younk and Bechard 1994). Foraging habitat use probably varies seasonally in response to prey availability. A key prey species, the Douglas squirrel, is associated with mature and old-growth forest conditions. A consistent characteristic with the majority of widely used prey species is that they regularly forage or occur on the ground or forest floor, rendering them vulnerable to goshawk predation. Forest management practices, such as timber harvest and fire suppression, that result in increased understory tree and vegetation density may reduce foraging habitat suitability for goshawks because of reduced access to prey or reduction in the herbaceous and shrub layers that provide food and cover for prey.

Information is needed on winter diets and habitat use. Further, the composition and distribution of vegetation at the core area or home range scales required to support replacement rate survival and reproduction in different vegetation types are unknown.

Threats

Habitat loss and degradation are the primary known threats to northern goshawks. Contemporary California forests are strikingly different in structure, composition, and function as a result of timber harvest and fire suppression management policies over the past century than what would occur under a natural disturbance regime and the resulting range of variability. Given current understanding of northern goshawk habitat requirements, timber harvest and fire suppression management policies have likely reduced habitat suitability for northern goshawks in California

through reductions in the amount and distribution of mature and old-growth forest stands and large trees, increases in understory tree density, and changes in tree species composition resulting in reduction of the proportion of pine in forest stands across broad areas. Nest-sites and territories have been lost following logging in nest stands and as a result of stand-replacing wildfires. There is also increased risk of loss of habitat to stand-replacing wildfire due to increased fuel loads and existing forest structure resulting from past management policies.

Northern goshawks are top-trophic level predators that have relatively large spatial requirements and occur at relatively low breeding densities. Populations are likely regulated by territorial behavior with breeding densities further affected by the availability of prey and suitable nesting habitat such that breeding pairs are more-or-less regularly distributed across landscapes when suitable habitat is present (Newton 1979, Joy 2002). The implication of this type of population distribution pattern and mechanism of population regulation is that landscapes can only support a certain number of territories and that the spatial distribution of habitat is important for maintaining a well-distributed population of goshawks. Therefore, managers must be concerned with two spatial scales. First, adequate high quality habitat must be available at the territory spatial scale to support replacement level survival and reproduction. Second, adequate amounts and distribution of habitat must be available at the landscape spatial scale to provide for viable, well-distributed populations. Currently knowledge is not available on the habitat conditions required to meet these management objectives at either spatial scale.

Past and current northern goshawk management standards and guidelines are focused on protecting nesting habitat at nest sites during project implementation. Management practices for goshawk nest sites territories on private forestlands in California range from protection of the nest tree and a few shade trees in the general area of the nest tree to protection of 5-20 acres around the nest tree. Little or no protection was directed at goshawk nest sites on USDA Forest Service (USFS) lands until approximately 20-25 years ago. Since then, management on USFS lands has

varied among individual Forests with focus on protection of 50-200 acres around known goshawk nest-sites. It is likely that many of these standards and guidelines are inadequate for maintaining long-term site occupancy. Woodbridge and Detrich (1994) reported that short-term re-occupancy rates approached 100% for core areas that had approximately 200 acres of suitable nesting habitat. Standards and guidelines adopted for Sierra Nevada forests as part of the Sierra Nevada Framework Project amend existing land management plans and require protection of the best available 200 acres of suitable nesting habitat around occupied nest sites. Although the Record of Decision has been signed for this project, modifications to proposed standards and guidelines might arise as the management direction is undergoing current review. Northwest Forest Plan reserves provide protection for additional territories in limited areas of northern California. Uncertainty exists regarding the effects of proposed landscape forest and fuels management strategies, designed to address wildfire risk, on northern goshawk populations and habitat quality on federal lands. Research is needed to determine habitat requirements of northern goshawks at the territory and landscape spatial scales and to assess the effects of fuels and timber management practices.

In addition to habitat degradation and loss, other potential threats include effects associated with human population growth, falconry harvest, contaminants, and disease. Increasing human populations in California and projected population growth and associated development on the western slope of the Sierra Nevada will likely result in further degradation and loss of northern goshawk habitat and breeding territories, increased disturbance due to human recreational activities, and increased wildfire risk associated with human ignitions. Northern goshawks are harvested for falconry in California. Current harvest levels do not affect statewide population numbers, although effects may occur locally if specific breeding territories or areas, such as territories on the Inyo National Forest in the eastern Sierra Nevada, are repeatedly harvested. Pesticides were not known to have had negatively affected northern goshawk populations (Snyder et al. 1973) and no information is available to suggest current problems with contaminants. No information is

available regarding the effects of diseases or parasites on northern goshawk populations. However, emerging diseases such as West Nile Virus have the potential to affect northern goshawks in California.

Management and Research Recommendations

Priority management needs are to: (1) establish a reliable procedure to accumulate and manage a statewide Northern goshawk nesting record database for tracking distributional patterns and assessing conservation status so that records are consistently updated each year across all state, federal and private land managers; (2) review current private and public land management standards and guidelines in light of new information; and (3) monitor the effects of management activities to evaluate the adequacy of management standards and guidelines on private and public lands.

Priority research needs are to: (1) develop approaches to monitor population trends; (2) develop habitat models to monitor change in habitat distribution, suitability and quality, and to predict the affects of alternative management scenarios at the territory and landscape spatial scales; (3) conduct inventories in areas where distributional information is required to assess status, such as the mountains of southern California; (4) conduct experiments or quasi-experiments on the effects of forest and fuels management on territory occupancy, demographic parameters and habitat suitability; (5) conduct basic demographic research to understand how survival and reproduction are affected by interactions among habitat, prey and weather; and (6) establish baseline information to monitor the effects of disease such as West Nile virus.

Collaborative efforts between research and management should be initiated in an adaptive management framework to assess the effects of forest and fuels management policies on northern goshawks and their habitat. Questions related to northern goshawk management should be placed within a larger context of the restoration of California forests and natural disturbance regimes (e.g., fire). Variation across major California forest types in terms of forest structure, composition,

function, patch size and distribution, and natural disturbance regimes dictate that management and conservation efforts be developed at appropriate spatial scales.

Monitoring Needs

The BBS and CBC are inadequate for monitoring population trends. Methods are needed to estimate population trends and monitor change in habitat suitability. Current efforts by the USFS to develop an approach for monitoring bioregional scale trends in occurrence and abundance will be applicable to California. Empirical habitat models should be developed to monitor changes in habitat distribution, suitability, and perhaps quality. Habitat models could be developed to perform as management tools to assess how alternative management activities are projected to affect habitat suitability and to generate predictions that can be monitored and field-tested in an adaptive management framework.

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